National Renewable Energy Laboratory
Solicitation for Letters of Interest (LOI) No. REU-1-11979

"SUNSHOT INCUBATOR"

REQUEST FOR LETTERS OF INTEREST

READ THIS DOCUMENT CAREFULLY

This Solicitation is being conducted under the procedures for competitive Letters of Interest established by the National Renewable Energy Laboratory (NREL). NREL will select a LOI for potential subcontract award based on the following.

- All requirements being met
- The best combination of:
  - Technical factors (based on evaluated qualitative merit criteria) and
  - Evaluated price

Issue Date: 05/06/2011 Due Date: 06/8/2011 Time Due: 11:59 P.M. Mountain Time

A Net Conference to address questions regarding the Solicitation is scheduled for 05/23/11; 9:30 – 11:30 A.M. Mountain Daylight Time. Interested parties can participate by calling 1-888-942-9539. Interested parties can also participate via the Internet at https://www.mymeetings.com/nc/join/. Conf. Number: PW7193514 Code: 7321269

Subsequent to the Net Conference, technical questions regarding the Solicitation must be received in writing via e-mail no later than 05/25/11

1. Solicitation Type **Best Value Letters of Interest**

SMALL BUSINESS SET-ASIDE

Submit responses electronically to and request information from the NREL LOI Contact below

2. NREL LOI Contact

Submit Responses electronically to and request information from The NREL LOI Contact

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Sr. Subcontract Administrator

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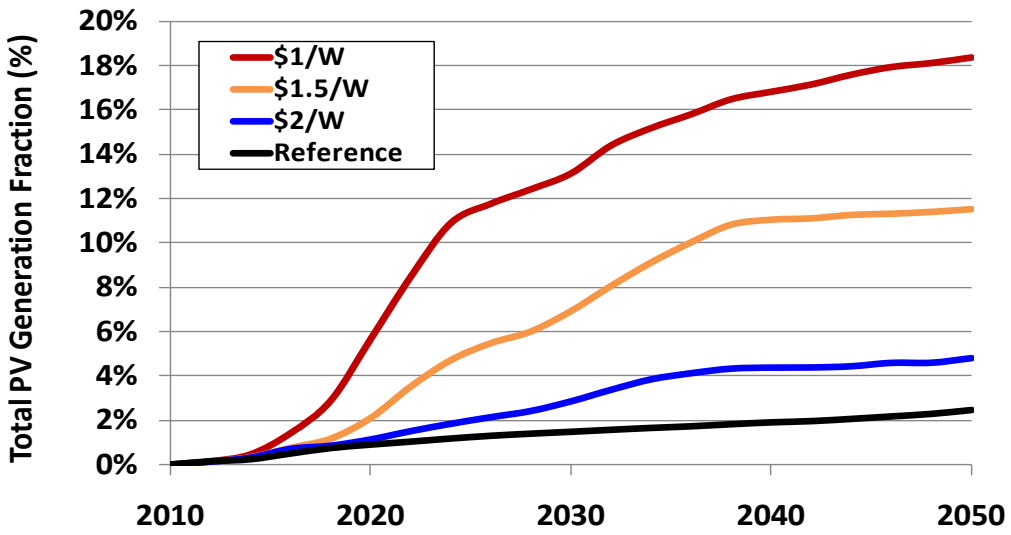
Electronic (PDF) copies of forms and appendices can be found at:
http://www.nrel.gov/business_opportunities/related_docs.html

3. Background

The mission of the U.S. Department of Energy (DOE), Office of Energy Efficiency and Renewable Energy (EERE), Solar Energy Technology Program (SETP)[1] is to accelerate the development and large-scale deployment of solar technologies in the United States and to ensure that solar power is a viable and economic source for the nation's power needs. SETP seeks to successfully achieve the goals of the SunShot Initiative[2]; enabling the domestic solar industry and research enterprise to achieve widespread grid parity without subsidies by the end of the decade through a program of applied research and development in solar materials, devices, and manufacturing technologies.

DOE estimates that a $1/W installed photovoltaic (PV) solar energy system — equivalent to 5–6¢ per kilowatt hour (kWh) — would make solar energy competitive with the wholesale rate of electricity without additional subsidies, nearly everywhere in the United States.[3] Achieving $1/W installed systems by 2020 represents a significantly more challenging goal than current "Business As Usual" projections of reaching $2.20/W for utility scale systems by 2016, and would enable large scale deployment of solar without subsidies. To reach this goal, PV module costs are anticipated to need to reach $0.50/W. Additionally, for the Balance of Systems costs, which typically scale with module area, to reach a target of $0.40/W, modules are expected to require efficiencies near or above 20%, with system lifetimes greater than 20-30 years.

Figure 3.1: Total PV Generation Fraction by Year



Previously, the Photovoltaic (PV) Technology Incubator Program focused solely on module-related PV technology innovations. This program has been extremely successful since its inception in 2007. However, given the new SunShot Initiative goals, the current program has now expanded to include concentrating solar power (CSP), power electronics, and balance of

[1] http://www1.eere.energy.gov/solar/
[2] http://www1.eere.energy.gov/solar/sunshot/
[3] http://www1.eere.energy.gov/solar/sunshot/pdfs/dpw_white_paper.pdf

systems (BOS) innovations and is now entitled the "SunShot Incubator Program." Any technological innovation that substantively aids in achieving a 6 cent/kwh levelized cost of energy for utility-scale installed cost for solar technology is eligible and will be considered as long as it meets the project requirements described below.

The SunShot Incubator Program represents a significant component of the DOE business strategy of partnering with U.S. industry to accelerate commercialization of PV, CSP, and BOS research and development (R&D) and validation to meet aggressive installed cost and market penetration goals. This specific partnership leverages technical capabilities and resources within the National Renewable Energy Laboratory (NREL) and other DOE laboratories/facilities to enhance and support areas of expertise within a small business in order to accelerate the development of the Responder's technology toward full-scale manufacturing in the United States. This early-stage assistance in crossing technological barriers to commercialization also provides a better level of understanding for the investment community to base decisions on. Although solar start-up companies have reaped the benefits from venture capital investments during the past 5 years, the current economic downturn has made it more challenging to raise the capital needed to launch new technologies.

Further goals for the SunShot Initiative relate to market penetration, job creation, domestic energy security, and avoided emissions. These goals, however, are expected outcomes of the primary SunShot goals stated above.

For the purpose of this Solicitation for LOI, a Responder must be a U.S. small business (see Section 6 - Qualification Requirements). Responders are required to directly address how the proposed project will accelerate the advancement of the Technology Readiness Level (TRL) (see Attachment B) of the technology as defined in Section 4 – Objectives. It is expected that the proposed disruptive technology will provide a pathway toward meeting or exceeding the goals of the SunShot Initiative. Small businesses that are proposing incremental approaches to already existing technologies are not considered responsive to this Solicitation for LOI. Examples of unacceptable incremental responses can be found in Section 5 – Scope of Interest.

The SunShot Incubator Program receives funds from the DOE, through subcontracts at NREL. To achieve the accelerated goals of the SunShot Initiative, NREL is dedicated to accelerating the time line for solicitation review and selection, and plans to release this solicitation twice per year. NREL expects a concise overview, strong technically detailed statement of work, strong team and resources, and a well thought out business plan (see Section 13 – LOI Response Preparation for details). Companies selected for negotiations will be held to specific turnaround times during the negotiation process (see Section 13.9 – Follow-on RFP Process). Responders that are not able to meet the required time line will be eliminated from negotiations.

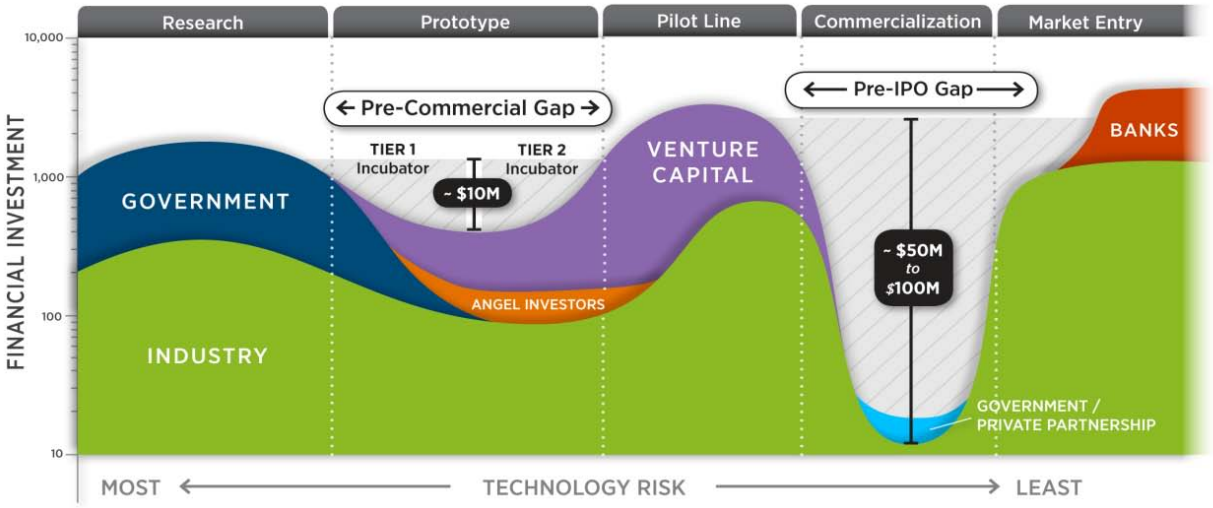
4. Objectives

This SunShot Incubator facilitates a U.S. small business's transition from proof of concept to commercialization in the United States. The emphasis on proposed activities (see Section 5 – Scope of Interest) should be focused on the barriers to manufacturing scale-up and commercialization by 2015. The SunShot Incubator provides significant opportunities for

collaboration between NREL, other DOE laboratories/facilities, and industry to further develop and improve disruptive and innovative solar energy technologies.

Figure 4.1 explicitly states where the SunShot Incubator's target companies and technologies exist within technology risk metrics. The figure illustrates two valleys: the first broad valley titled "Pre-Commercial Gap" is the focus of the SunShot Incubator Program. The objective of this SunShot Incubator is to launch new start-up businesses and/or new business units within an existing commercial entity, as well as to enable high-risk, differentiated technologies to become commercial products. This Solicitation for LOI is not for incremental improvements to the current production processes of small businesses. See Section 5 – Scope of Interest for more details. Companies previously funded under the PV Technology Incubator/Pre-Incubator may participate in accordance with the guidelines provided.

Figure 4.1: Financial Investment Described by Technology Risk



Companies may be at different levels of maturity (see TRL definitions in Appendix B) and therefore NREL will accept responses to this Solicitation for LOI in two categories: Tier 1 and Tier 2.

A. Tier 1

The primary objective of Tier 1 of the SunShot Incubator Program is to accelerate the development of innovative solar and BOS technologies to the prototype stage. Generally, this 12-month tier will apply to those companies that have not finalized their technology designs or assembly processes to the point where they are ready to design or implement pilot manufacturing.

The entrance criterion for Tier 1 of this Solicitation for LOI is a lab-scale material, device, product, or process typically at TRL 4 (see Attachment B) that is a quantitative, physical demonstration of the technology chosen for prototype development. At this

TRL, components of the technology are validated and integrated into a preliminary yet physically functional demonstration. Modeling and simulation without a working device are not acceptable, but may be used to complement physical experiments and to illustrate the potential of the technology. Small-scale baseline demonstrations are required for entrance into Tier 1.

Successful completion of Tier 1 is a commercially relevant technology (e.g., containing no cost-prohibitive materials) assembled with commercially relevant, albeit lab-scale, processes at a commercially relevant size. This R&D effort will quickly move companies into a position to be competitive for SunShot Incubator Tier 2 funding opportunity.

B. Tier 2

The primary objective of Tier 2 of the SunShot Incubator Program is to shorten the time line for companies to transition innovative full-scale materials, devices, or systems produced at lab scale and pre-commercial prototypes into pilot and eventually full-scale manufacture. Generally, the Incubator concept will apply to those companies that are not far enough along with their technology and product development pathways to qualify for late-stage equity investments or for other DOE programs such as the Loan Guarantee Program. Successful participation in this Incubator project will quickly move companies into pilot stage and later to full commercial production.

The entrance criteria for Tier 2 is a solar or BOS technology with a demonstrated baseline of a commercially relevant, lab-scale prototype material, device, module, or system that can be scaled up to pilot production within an 18-month time frame, which is typically TRL 5 (see Attachment B). A successful exit from Tier 2 would be the fabrication of the advanced prototypes on a pilot-production line (i.e., pilot-scale manufacturing) with processes that are representative of, or feasible to implement in, full-scale commercial manufacturing. The pilot-production line should be capable of performing the functions and/or processes required of a potentially full manufacturing system for the given technology. Refinement of the cost model, significant reduction in engineering risk, and the generation of statically relevant results are expected as a result of successful Tier 2 projects. It is the intent that those selected for award will manufacture their product or processes in the United States and will follow the guidance set forth in the subcontract. Awardees will need to state explicitly in their business plan their intent to manufacture in the United States.

Responders to this Solicitation for LOI must designate a Principal Investigator (PI) for each response. A PI can provide a response for either Tier 1 or Tier 2, but not both. Responders can submit multiple responses to both Tier 1 and Tier 2, provided that each response has a different PI and is a completely different proposed technology platform. It is not necessary to have participated in Tier 1 to apply for Tier 2 of this solicitation.

<u>Key Performance Parameters for Tier 1 and Tier 2</u>

Although the Solar Energy Technologies Program (SETP) program uses LCOE as a cumulative metric, it recognizes that lower-level metrics are typically more useful for early-stage R&D focused on a single element of the solar value chain. For this purpose, SETP has defined a set of

Key Performance Parameters (KPP) as a means of tracking progress for individual subcontracts and the overall program (Table 4.2). In addition to these KPPs, Responders may establish appropriate additional metrics to track progress toward project objectives. Examples of these technology-specific metrics include processing speed, yield, material utilization, and uniformity. Explicit relationships between projected improvements and the relevant KPPs must be included in the response. For PV technologies, device performance and cost per watt (efficiency and cost per area to produce) are expected to be the most relevant KPPs for these projects. For CSP technologies, examples of relevant KPPs include dollar per square meter of collector area and efficiency (optical, thermal, or cycle). Manufacturing capacity and reliability (Mean Time Between Failure – MTBF and performance degradation rate) should also be an important factor in any technology development plan.

Responders must clearly articulate how task improvements will impact the goals of the SunShot Initiative, relevant SETP KPPs, as well as details describing their cost models and the ability to meet the described SunShot goals. Responder's baseline of the technology should be provided in terms of measurements and characterization data or other data that can show demonstration of a baseline process to commercialization. A clear example of this for a proposed PV technology would be an I-V curve of a device/cell and/or other quantifiable data. An example for a proposed CSP technology would be a high-temperature TES or optical materials with theoretical or measured properties that meet relevant CSP KPPs, or a conceptual design or lab mock-up of a component (e.g. collector/receiver component, turbine/cycle component). An example for power electronics may be an efficiency curve. An example for BOS might be reduced parts count. The baseline data must be representative of the tier the PI is responding to. It is anticipated that an extremely strong prototype associated with Tier 2 would demonstrate key metrics—including scale-up parameters to pilot-scale production. Examples of this are throughput, takt time, etc.

Table 4.2: Example Key Performance Parameters

Metric	Units	Comments
Direct Manufacturing Cost	$/Wp or $/m^2 (provide assumptions)	This is the direct manufacturing cost of a subsystem and/or component that includes materials, labor, equipment depreciation, facilities costs, etc. Megawatts of annual subsystem and/or component manufacturing capacity must be included. If this is being discussed as a goal/target, the current cost must be outlined and discussed in detail as well.
Component Performance Factor(s)	Unit To Be Determined by Responder	This performance factor(s) should be selected by the Responder to represent the driving contribution to system-level performance that will be provided by the subsystem and/or component that Responder is improving. This metric is based on performance only, and does not take into account cost or lifetime issues.
Reliability	Annual Degradation Rate	Used to quantify the expected performance of a subsystem and/or component over time, which is necessary to accurately calculate the LCOE of a system.

5. Scope of Interest

NREL is soliciting Tier 1 and Tier 2 LOIs from individual U.S. small businesses and/or U.S. small-business-led teams working on the R&D of demonstrated, innovative, differentiated, and potentially disruptive concepts and prototypes in the areas of PV, CSP, and BOS. The emphasis of this Solicitation for LOI for Tier 1 and Tier 2 is on overcoming the barriers to commercialization of products and processes to making solar electricity cost competitive with conventional forms of electricity, without subsidies, by the end of the decade. The Responder must provide a detailed plan of the proposed technology development, including current and future cost and performance values, that demonstrate the ability to meet the SunShot goals. While risk mitigation should be addressed within the LOI, it is assumed suitable technologies will possess a significant amount of risk. Topic Areas include, but are not limited to:

Photovoltaics:

- Novel wafer-based silicon modules
- Novel thin-film technologies
- Film silicon on a foreign substrate
- Concentrating PV module concepts
- High efficiency concepts (e.g., multijunctions)
- Nanostructure-based concepts
- Very low-cost module/cell/wafer processes

Balance of Systems:

- Plug-and-play wiring and installation techniques
- Integration of PV into building components or building-integrated PV (BIPV)
- Development of standardized workforce safety techniques (e.g., anchoring) and leveraging of specialized ground-to-roof hoisting equipment
- Roof-mounted PV systems including roof-mounting techniques
- Ground-mounted systems including developing and using new, solar-optimized materials that reduce the use of standard mounting materials (e.g., steel, aluminum, concrete)
- Development of automated machinery and/or robotics to drive piles and to place modules for ground-mounted systems
- Data acquisition and monitoring for PV systems.

Power Electronics:

- Low-cost modular PV inverters/ components
- AC modules – small PV inverters to mount onto a single or small group of modules
- Development of low-cost DC converters to boost DC voltages from modules or strings of modules
- Development of inverters that operate at higher DC and AC voltages/wiring
- Higher frequency switching technologies or moving to transformer-less designs to reduce converter size and weight for inverters

- Advanced communications integrated with PV inverters
- Enhanced energy harvesting through new algorithms for maximum power point tracking (MPPT)
- Enhanced smart grid functionality incorporated into PV inverters
- PV system technologies that mitigate fire hazards and enhance safety in general.

Concentrated Solar Power (see ATTACHMENT C for a more detailed description of acceptable CSP-specific topic areas):

- Low-cost solar field components
- High-temperature, low cost, thermal storage materials and systems
- High performance reflector and high-temperature absorber materials
- High efficiency power cycles
- Novel CSP systems

This Solicitation for LOI is not intended to fund incremental improvements in existing technologies. NREL understands that these incremental improvements to existing technologies can be extremely compelling and offer significant improvements, however, NREL is not seeking responses of this type and they will be considered non-responsive to the requirements for LOI. An incremental improvement, as opposed to a new technology platform, is one that is intended to replace or improve the currently manufactured product. A primary objective of the SunShot Incubator is to launch new start-up businesses and/or new business units within an existing commercial entity. Consequently, if a company already has an existing commercial product, it would only be eligible as a Responder to this Solicitation for LOI if the proposed technology is a completely different technology platform from the company's current technology. Responses determined to be incremental will not be considered for review. Examples of unacceptable LOIs include, but are not limited to:

Technology development on an existing manufacturing line to enhance efficiency and/or reduce cost. This would be considered a second-generation product. Specific examples include:

- Changing from a p-type to n-type silicon wafer technology
- Back contact development
- Transparent conducting oxide (TCO) development
- Addition of junction(s) to existing multijunction devices for high-concentration PV applications.

6. Qualifications and Requirements

- The minimum entrance criterion for Tier 1 of this Solicitation for LOI is a lab-scale material, device, product, or process typically at TRL 4, which is a quantitative demonstration of the technology chosen for prototype development.

- The minimum entrance criteria for Tier 2 is a demonstrated baseline of a commercially relevant, lab-scale prototype material, device, module or system that can be scaled up to a pilot-production-ready process within an 18-month time frame; typically TRL 5.
- To facilitate DOE's preference for U.S. industry, the Responder agrees that neither it nor any assignee will grant to any person the exclusive right to use or sell any Subject Invention in the United States unless such person agrees that any product embodying the Subject Invention or produced through the use of the Subject Invention will be manufactured substantially in the United States. This principle further promotes the SETP's goals of giving preference to business units located in the United States that agree to substantially manufacture the resulting technology in the United States (See Attachment D – U.S. Competitiveness Requirements and Utilization Reporting).
- All activities shall be conducted in a safe and environmentally responsible manner. The improvement of operations to further reduce waste streams and conduct operations in a safe work environment may be elements in the proposed work effort.
- All efforts funded under this project shall be performed by a U.S. small business located within the United States or its territories. A U.S. company is defined as a business incorporated or formed as a legal entity in the United States.
- This Solicitation will accept responses from U.S. small businesses only. U.S. small businesses submitting a LOI in response to this Solicitation are referred to herein as Responders. For questions about small business size standards please refer to the U.S. Small Business Administration's guide to size standards at http://www.sba.gov/content/guide-size-standards.
- Responders can apply to both Tier 1 and Tier 2 of this solicitation, provided that each response has a different PI and is a different proposed technology platform.
- Any proposed funding amount exceeding the maximum funding level, as defined in Sections 5 and 7, will be considered part of the Responder's price participation.
- The response must clearly address the objectives detailed in Section 4 of this solicitation.
- The response must strictly adhere to the LOI Response Preparation Information contained in Sections 9 and 13 of this solicitation. Responses that fail to adhere will be considered non-responsive to the requirements of this solicitation.
- Responders to this Solicitation for LOI may propose and lead a team subject to the following restrictions:
    - The Responder will designate a point of contact
    - The Responder will execute the subcontract with NREL and be responsible for all subcontracted obligations and activities (including lower-tier subcontractors)
    - U.S. small businesses, U.S. large businesses, U.S. non-profit entities, and U.S. educational institutions are eligible to be lower-tier subcontractors to the Responder
    - U.S. small businesses, U.S. large businesses, U.S. non-profit entities, and U.S. educational institutions are eligible to be lower-tier subcontractors on more than one response to this Solicitation for LOI
    - Lower-tier subcontractor funding, including lower-tier funding to U.S. large businesses, is limited to no more than 20% of the total subcontract amount

- The Responder shall perform, at a minimum, 80% of the total proposed project work effort.
- The Response must contain at least 20% price participation on behalf of the Responder/Team for Tier 1 and 50% price participation for Tier 2, relative to the entire project price. This requirement is applied to the entire project price, not each team member's price independently.

7. Potential Subcontract Award, Resources, and Available Project Funding

The Alliance for Sustainable Energy, LLC has entered into Contract No. DE-AC36-08GO28308 with the Department of Energy (DOE), an agency of the U.S. Government, for the management and operation of the National Renewable Energy Laboratory (hereinafter called "NREL"). All references to "NREL" in this solicitation shall mean the Alliance for Sustainable Energy, LLC.

It is the intent of NREL to award a total of three to seven firm fixed price (w/price participation) subcontracts under Tier 1, and two to three firm fixed price (w/price participation) subcontracts under Tier 2 of this solicitation. Fixed firm price with price participation subcontracts have demonstrated success in the PV Incubator Program. These subcontracts pay for performance metrics: funds are delivered after a deliverable is met; if a deliverable is not met, the funds are not delivered. The actual number of awards may vary based on the LOIs received and the availability of funds. NREL reserves the right to make any number of awards or to make no awards under this solicitation. NREL funding available for each individual Tier 1 award under this solicitation will not exceed $1 million for the anticipated 12-month duration of the work effort. NREL funding available for each individual Tier 2 award under this solicitation will not exceed $4 million for the anticipated 18-month duration of the work effort. NREL retains the right to extend the work effort beyond the initial period of performance based on Subcontractor performance and evaluation.

A. Tier 1:

It is expected that the subcontract duration will be for 12 months at a maximum NREL funding amount of $1 million for each award made under Tier 1 of the solicitation. It is expected that the actual amount of funding requested is commensurate with the proposed work effort and requirements associated with moving the technology forward. The cost-share requirement is 20% for Tier 1 awards.

B. Tier 2:

It is expected that the subcontract duration will be for 18 months at a maximum NREL funding amount of $4 million for each award made under Tier 2 of the solicitation. Additionally, each 9-month phase should comprise approximately 50% of the subcontract total award to maintain the balance of the project. It is expected that the actual amount of funding requested is commensurate with the proposed work effort and requirements associated with moving the technology forward. The cost-share requirement is 50% for Tier 2 awards.

NREL and other DOE laboratories/facilities have technical support and services available to assist in meeting the objectives of the SunShot Incubator Program. NREL and other DOE laboratories/facilities can provide technical support and services, and consultation for the proposed work effort. Responders to this solicitation are encouraged to list the technical services, provided by NREL and other DOE laboratories/facilities, beneficial to their work effort in their LOI (see Section 13.6). The technical services available by NREL and other DOE laboratories/facilities will be provided in Amendment 1. The Responder only needs to list the technical services that will be beneficial to the work effort. The Responder should not contact specific DOE laboratory/facility personnel regarding these support services and no teaming agreements or letters of support are required as part of this solicitation. As a guide, the amount of technical services and support available to a successful Responder is limited to approximately 5% of the award amount. This technical support and service activity is funded independent of and separate from the SunShot Incubator Program awards under this solicitation. NREL technical support and services are provided as a part of DOE's funding directly to NREL. For technical support and services provided by other DOE laboratories/facilities, funding resources may be transferred by NREL through integrated contractor work orders (memorandum purchase orders). The determination and assignment of specific technical support and services will occur during subcontract negotiation.

This Solicitation for LOI is for R&D and validation to result in development or demonstration of solar technologies. It is not intended to fund the acquisition of production line equipment. **Therefore, no capital equipment funds are available under this solicitation.** Capital equipment is defined as equipment with a unit value of $50,000 or more, including applicable shipping and installation charges, and having a life expectancy of 2 years or more. Purchase of capital equipment shall be covered by the Responder's price participation.

Responders are further advised that all equipment (personal property) purchases must be acquired through price participation to the project by the Responder and by price participation by the Responder's lower-tier subcontractors or suppliers at no cost to NREL.

The following information in italics is provided for planning purposes only and is not part of the submittal requirements of this Solicitation for LOI.

In the event a Responder is selected for negotiations with the intent of reaching agreement on the award of a subcontract, the successful Responder will be required to provide a detailed list of any equipment items planned to be purchased along with a price for the acquisition of each. The individual price proposed for each item shall be verifiable via vendor quote, price sheet, or other means deemed acceptable by NREL.

In the event a successful Responder intends to utilize technical support and services provided by NREL and/or other DOE laboratories, funding for the technical support and services will be provided as a part of DOE's funding directly to the laboratory, which is independent of and separate from the SunShot Incubator awards under this solicitation.

A *minimum* of 20% price participation is required for a Tier 1 award; a *minimum* of 50% price participation is required for a Tier 2 award. Price participation is defined as a percentage of the total allowable and allocable costs under the subcontract, which may be met by contributions by the Subcontractor and by contributions from the Subcontractor's lower-tier subcontractors or suppliers at no cost to NREL. In addition:

- All costs, both proposed NREL price participation amount and Subcontractor's price participation amount, must be allowable, reasonable, and allocable in accordance with the Federal Acquisition Regulations (FAR) Part 31 and DOE Acquisition Regulations (DEAR) Part 931.
- The Subcontractor's and lower-tier subcontractor's price participation amounts shall not be funded by other Federal contracts and/or grants.
- Legal, financial, and management costs in connection with the planning or execution of a corporate structure and raising capital (net worth and long-term liabilities) are not allowable (FAR 31.205-27) costs, and should not be included in the proposed direct or indirect costs in either NREL's or the Subcontractor's price participation amount.
- Material, labor, and other costs incurred for the manufacture of products intended for resale will not be considered under either NREL's or the Subcontractor's price participation amount.
- Foreign travel is not allowable under either NREL's or the Subcontractor's price participation amount.

8. Competitive Solicitation for Letters of Interest Using Best Value Selection

This solicitation for Letters of Interest shall be conducted using Best Value Selection that results in the selection of LOIs for potential subcontract award that is most advantageous to NREL based on the best value combination of (a) evaluated qualitative merit and (b) evaluated price/cost of the LOIs submitted.

Best Value Selection is based on the premise that, if all LOIs are of approximately equal qualitative merit, award will be made to the LOIs with the lowest evaluated price/cost. However, NREL will consider selecting an LOI with a higher evaluated price/cost if the offer demonstrates the difference in price/cost is commensurate with the higher qualitative merit. Conversely, NREL will consider selecting an LOI with a lower evaluated qualitative merit if the price/cost differential between it and other LOIs warrant doing so.

9. Qualitative Merit Criteria for Best Value Selection

The objective (see Section 4), scope of interest and resources (see Section 5), qualification requirements (see Section 6), and adherence to the LOI response preparation requirements (see Section 13) of this solicitation serve as NREL's baseline requirements that must be met by each LOI. ***Only those LOIs that adhere to these requirements will be evaluated with respect to the qualitative merit criteria and considered for potential selection for subcontract negotiation.***

The qualitative merit criteria (see 9.1–9.3 below) establish what NREL considers the technical factors valuable in an LOI. These qualitative merit criteria are performance-based and permit

selection of a higher-priced LOI that provides higher qualitative merit. NREL reserves the right to conduct site visits to Responders of this Solicitation for LOI prior to selection. NREL shall further have the option to complete testing/validation of cell/devices or modules for verification purposes during the negotiation process. In addition, NREL reserves the rights to contact Responders for clarifying questions regarding their responses to the Solicitation for LOI.

The following qualitative merit criteria, and their assigned weights, will be used to determine the technical value of the offer in meeting the objectives of this solicitation.

Each qualitative merit criteria and its assigned weight are provided below. Sub-merit criteria are equally weighted.

9.1 Quality and Relevance of the Proposed Technical Plan (50%)

- Extent of technical innovation and disruptive potential to dramatically reduce costs
- Extent of differentiation with respect to existing commercial technologies
- Potential to meet the SunShot Initiative goals
- Degree to which current technology is quantitatively base-lined for the specified tier level
- Adequacy in demonstrating the ability to complete the work proposed
- Adherence to the content and format requirements of Section 13 (LOI Response Preparation), including:
  - The quality, depth, and detail of the proposed technology description
  - A detailed technical plan and schedule to achieve stated goals
  - Articulation of tasks and subtask activities including milestones and deliverables
  - Completion of the Technical Task Summary and Deliverable Tables.
- Adequacy, value, and reasonableness of the schedule and quality of the plan in addressing KPPs, barriers, and risks, and describing approaches to overcoming identified barriers and risks. Extent to which the Responder understands and discusses the technical risks, challenges the proposed work will face, and the soundness of the strategies and methods that will be used to overcome them.

(Response content applicable to this merit criterion should be contained in the Project Overview, Technical Work Plan, and Deliverables Sections of the LOI – See Section 13.)

9.2 Quality and Relevance of the Proposed Business Strategy (30%)

- Relevance and value of project objectives in demonstrating development toward manufacturing and commercialization of the product in the United States.
- Identification of target market(s) and the clarity of the business strategy in identifying market objectives (segment, price, volume/size, region, etc.) and that these objectives are aligned with the Responder's technology, capabilities, and resources.
- A general (for Tier 1 responses) or detailed (for Tier 2 responses) discussion of the total systems-level installed cost of the technology. Even if the technology is a

subsystem component, it is important to show how it will fit into a total system. (For example, a novel CPV approach should also discuss the tracking cost that may be required, how it would be wired (is it high voltage?), and what kind of inverter would be used and why).

- Reasonableness of the assumptions used to form the business strategy, i.e., market size, price of silicon, manufacturing takt time and throughput at full scale, full-scale equipment cost, how fast a scale-up is proposed, and how it will be funded.
- Identification and accurate assessment of business risks and assumptions.
- Viability of the Responder's commercial manufacturing scale-up plan for rapid market penetration and the likelihood that the long-range business strategy will be successful enough to meet the SunShot Initiative goals.
- Demonstration of a clear understanding of the goals of the SunShot Initiative with clear articulation of how the proposed technology will significantly aid in the overall achievement of its goals.
- Clarity of the capital plan for commercialization as well as anticipated funds required to commercialize the technology proposed.

(Response content applicable to this merit criterion should be contained in the Business Plan Section of the LOI – See Section 13.)

9.3 Technical Capability of the Responder/Team (20%)

- Qualifications of the Responder's infrastructure, resources, and credentials, including previously demonstrated innovations, to achieve the project objectives (including proposed lower-tier subcontractors).
- Experience and demonstrated performance of the Responder. Demonstrated skills and experiences of the lower tiers, if a team is proposed, resulting in a team that is more capable of addressing the objectives and goals than any one of the team members individually.
- Extent to which the Responder/team has the experience needed to complete the scope of work. For example, if a concentrating PV technology is proposed, members would, at a minimum, need experience in both optics AND PV devices.
- A clear description of the technical services identified for NREL and other DOE laboratories/facilities.

(Response content applicable to this merit criterion should be contained in the Technical Qualifications and Resources Section of the LOI – See Section 13.)

10. Price/Cost Evaluation for Best Value Selection

The combined qualitative merit value will be considered substantially more important than the price/cost.

11. Additional Factors for Evaluation

In addition to the qualitative merit criteria above, each LOI will be evaluated against other programmatic factors to determine the final rank order. Programmatic factors will include: the degree of apparent efficiency of leveraging NREL resources; portfolio diversity within the technology topics areas; portfolio diversity associated with time to market and/or development of pipeline; the potential to strengthen the U.S. manufacturing capacity; and overall SunShot Goals. Unlike the Merit Review Criteria, these factors are not weighted. NREL reserves the right to conduct site visits to Responders of this Solicitation for LOI prior to selection. NREL further reserves the right to negotiate a subcontract with a Responder in a different tier than the one they responded to. For example, if the Responder applied to Tier 1, NREL could shift them into Tier 2 or vice-versa based on NREL's technical assessment of the technology.

12. Evaluation Process

NREL will evaluate LOIs in two general steps:

Step One – Initial Evaluation

An initial evaluation will be performed to determine if all required information has been provided for an acceptable LOI. The objective (see Section 4), scope of interest and resources (see Section 5), qualification requirements (see Section 6), and adherence to the LOI response preparation requirements (see Section 13) of this solicitation serve as NREL's baseline requirements that must be met by each LOI. Only those LOIs that adhere to these requirements will be evaluated with respect to the qualitative merit criteria and potential selection for subcontract negotiation.

Of particular note, if a company already has an existing commercial product, the company would only be eligible as a Responder to this Solicitation for LOI if the proposed technology is a completely different technology platform from its current technology. This Solicitation for LOI is not for incremental improvements to the Responder's current production process. Section 5 discusses this in more detail. In addition, late submissions and those that exceed page limits are not acceptable.

Responders may be contacted only for clarification purposes during the initial evaluation. Responders shall be notified if their LOI is determined not acceptable, and the reasons for rejection will be provided. Unacceptable LOIs will be excluded from further consideration.

Step Two – Discussion and Selection

All acceptable LOIs will be evaluated against Section 9 – Qualitative Merit Criteria for Best Value Selection. Responders selected through the best value selection process will be contacted with the intent to negotiate an acceptable Statement of Work, based on the Responder's LOI.

13. LOI Response Preparation

LOI responses should be arranged in the following order and within the appropriate page count for each section; strict adherence is required. The total response should not exceed 26 pages for either Tier 1 or Tier 2 (excluding the completed Representations and Certifications as listed in Section 13.9). ***An LOI response exceeding specific and total page count limitations will be rejected as non-responsive to the solicitation.***

Formatting instructions are as follows:

- A page is defined as one side of an 8 ½" x 11" sheet of paper.
- Use Times New Roman no smaller than 11-point font.
- Maintain at least 1-inch margins on all sides.
- LOIs shall be submitted as a PDF attachment to an e-mail addressed to the NREL LOI Contact. The e-mail shall include the solicitation Number (REU-1-11979) and the project title (SunShot Incubator) in the subject line.
- The PDF attachment shall include the entire LOI response (limited to 26 pages) and the Representations and Certifications document.

The LOI submission must be directed toward meeting the requirements of the solicitation. Responders should provide only the minimum amount of information required for proper evaluation. Keep the LOI as brief as possible and concentrate on substantive information. Also, this solicitation does not commit NREL to pay costs incurred in the preparation and submission of a response to this request for LOI.

The LOI should be organized, as described below, into several main sections, each with a specific focus and purpose. The sections are:

Title Page - 13.1

Project Overview - 13.2

Technical Work Plan - 13.3

Deliverables - 13.4

Business Plan - 13.5

Technical Qualifications and Resources - 13.6

Price Summary Sheet - 13.7

Representations and Certification - 13.8

The following is a detailed description of the required content for each section of the LOI.

13.1 Title Page – 1 page maximum

The LOI must include a title page, which incorporates the Request for LOI number and the Responder's project title, tier response (Either 1 or 2), name of the organization, PI (with postal address, telephone and fax numbers, and email address), and two or three sentences describing the technical area that the LOI addresses. *If a Responder is already in pilot production in the solar arena, please state current technology and area being proposed that is different.*

13.2 Project Overview – 5 page maximum

13.2.a Background

Provide a summary of the proposed project and how it meets to the SunShot Initiative objectives. Specifically, this section should discuss the history, successes, and current status of the Responder's technology and product development.

Note: this section is not for discussing the merits of solar energy in general, or the proposed technology in regard to other non-solar technologies.

13.2.b Objectives

This section should contain a high-level narrative discussion introducing the R&D and validation objectives that will be pursued under this effort over its 12-month (Tier 1) or 18-month (Tier 2) duration. A quantitative baseline, appropriate for the specific entrance criteria of the chosen tier, must be provided (e.g., an I-V curve of the device/cell and/or module). The baseline data will be the starting point for the detailed objectives of the proposed technology. The discussion should explicitly identify improvements to the baseline technology performance and critical success factors the effort is designed to address to meet the proposed project objectives.

13.2.c Overview of Costs and Commercial Viability

The approach to this SunShot Incubator is to specifically accelerate commercialization of PV, CSP, and BOS R&D and validation to meet aggressive SunShot Initiative installed cost and market penetration goals in the United States. Responders need to address how they plan to achieve this in terms of a cost breakdown demonstrating their relevance. The cost breakdown should demonstrate the ability to significantly drive down the cost of the proposed technology.

Note: this section should be a concise overview and summary of the detailed cost analysis that is explained and discussed in the business plan section. Provide the high-level findings that make this technology compelling in regard to the goals of the SunShot Initiative.

13.2.d Conclusion

Any closing remarks the Responder feels should be discussed prior to the technical work plan.

13.3 Technical Work Plan – 12 page maximum

This section shall contain a concise technically detailed description of the specific R&D and validation solar activities to be conducted over the proposed tier period of performance. "Technically detailed" is defined as a full scientific explanation and disclosure of the technology being proposed (i.e., sentences such as "we will then deposit a proprietary material" should not be used). All reviewers are external to NREL and sign Confidentiality Certificates under an NREL subcontract, and therefore the responsibility is on the Responder to submit adequate representation of its detailed task plan to convince the reviewers that its technology can meet the SunShot Initiative goals. The Technical Work Plan should be divided into two (2) 9-month phases for Tier 2 projects, with Phase 1 covering the first 9 months and Phase 2 covering the second 9 months. Tier 1 responses do not need to make this distinction.

The format to follow when constructing the technical work plan is listed directly below and explained in detail in this section:

Scope of Work discussion

Task 1 Description and Discussion
- Subtask 1.1 Description and Discussion
- Subtask 1.2 Description and Discussion
- Etc. continue until completion of subtask discussion for Task 1

Task 2 Description and Discussion
- Subtask 2.1 Description and Discussion
- Subtask 2.2 Description and Discussion
- Etc. continue until completion of subtask discussion for Task 2

Etc. continue until completion of all task discussions.

The Milestone/Metric Table should be attached to the end of the response as an appendix and does not count toward the page limit.

The task descriptions shall explicitly identify the KPP(s) being addressed and quantitative metrics associated with those KPPs. Task descriptions should also consist of a distinctive title, a concise statement of the objectives, focus and goals of that task, as well as the proposed subtask activities that make up the task effort. In general, task descriptions and milestones are typically tracking progress at the KPP level (e.g., efficiency, reliability, cost), and subtask activities focus on the more specific and detailed work efforts that go into achieving those higher-level goals (e.g., material composition, material quality, component design). *It is critical that the specific activities identified in this section are clearly linked to their impact on the identified tasks and KPPs. It is equally important that each task be broken out into component subtasks to show clearly how each task will be accomplished.*

The milestones discussed in the task and subtask narrative are tracked in the Milestone/Metrics Tables (see Table 13.1) and form the foundation for defining and achieving the project deliverables (see Section 13.4). It is important that the task structure supports the proposed deliverables. Each task and each subtask must contain a series of milestones contained within the Milestone/Metrics Table. *The Milestone/Metric Table should be attached to the end of the response as an appendix and does not count toward the page limit.*

The task and subtask descriptions must adhere to the following format:

The inclusion of the Task #, Task Title, Task Start Date, and Task End Date

Include a task description that explicitly identifies the KPP(s) being addressed and quantitative metrics associated with the task. This should contain a high level, or detailed if there are no associated subtasks, description of the objective, description of the work effort aimed at achieving the objective, what metrics will be used to monitor progress and success, and how these metrics will be determined or measured. The narrative should also include identification of barriers and risks, and the approaches for overcoming those barriers and risks. Where appropriate, multiple pathways early in the effort will be considered important and should be outlined for risk reduction. The Milestone/Metrics Table should also be filled out to identify the anticipated progression of all task milestones on a quarterly basis, starting with the currently existing baseline value and ending with the final target milestone for that task effort.

The following should be included for all subtasks contained within each Task X:

Task # consists of xx subtasks:

Subtask #.1: Subtask Title

Include a subtask description that explicitly identifies the KPP(s) or performance aspects being addressed and quantitative metrics associated with those aspects within a task. This should contain a detailed description of the objective, description of the work effort aimed at achieving the objective of the specified task, what metrics will be used to monitor progress and success, and how these metrics will be determined or measured. The narrative should also include identification of barriers and risks, and the approaches for overcoming those barriers and risks. Where appropriate, multiple pathways early in the effort will be considered important and should be outlined for risk reduction. The Milestone/Metrics Table should also be filled out to identify the anticipated progression of all subtask milestones on a quarterly basis, starting with the currently existing baseline value and ending with the final target milestone for that subtask effort.

Table 13.1: Milestone/Metric Table

Task #: Task Title		
	Milestone	**Device Size/Scale/Metric**
Month 0 (baseline)	Detailed description to include specific and quantifiable metric.	Specify if the device size, flow rate, speed, or some other metric is changing along with the milestone.
Month 1		
Month 3		
Month 6		
Month 9		
Month 12		
Month 15	**(Tier 2 only)**	**(Tier 2 only)**
Month 18	**(Tier 2 only)**	**(Tier 2 only)**
Subtask #: Subtask Title		
	Milestone	**Device Size/Scale/Metric**
Month 0 (baseline)	Detailed description to include specific and quantifiable metric.	Specify if the device size, flow rate, speed, or some other metric is changing along with the milestone.
Month 1		
Month 3		
Month 6		
Month 9		
Month 12		
Month 15	**(Tier 2 only)**	**(Tier 2 only)**
Month 18	**(Tier 2 only)**	**(Tier 2 only)**
Subtask #: Subtask Title		
	Milestone	**Device Size/Scale/Metric**
Month 0 (baseline)	Detailed description to include specific and quantifiable metric.	Specify if the device size, flow rate, speed, or some other metric is changing along with the milestone.
Month 1		
Month 3		
Month 6		
Month 9		
Month 12		
Month 15	**(Tier 2 only)**	**(Tier 2 only)**
Month 18	**(Tier 2 only)**	**(Tier 2 only)**
Etc.		
Task #: Task Title		
	Milestone	**Device Size/Scale/Metric**
Month 0 (baseline)	Detailed description to include specific and quantifiable metric.	Specify if the device size, flow rate, speed, or some other metric is changing along with the milestone.
Month 1		
Month 3		
Month 6		
Month 9		
Month 12		
Month 15	**(Tier 2 only)**	**(Tier 2 only)**
Month 18	**(Tier 2 only)**	**(Tier 2 only)**
Subtask #: Subtask Title		
	Milestone	**Device Size/Scale/Metric**
Month 0 (baseline)	Detailed description to include specific and quantifiable metric.	Specify if the device size, flow rate, speed, or some other metric is changing along with the milestone.
Month 1		
Month 3		

Month 6		
Month 9		
Month 12		
Month 15	**(Tier 2 only)**	**(Tier 2 only)**
Month 18	**(Tier 2 only)**	**(Tier 2 only)**

13.4 Deliverables – 2 page maximum

The SunShot Incubator Program employs a Firm Fixed Price with Price Participation subcontracting mechanism and thus requires quantifiable deliverables in subcontracted projects. This requirement will serve to assure rigorous project management and support NREL's continuous assessment of its investment in the Incubator program. The project plan should include the completed Tables 13.2 or 13.3 (for either Tier 1 or Tier 2) entitled "Deliverable Table" (see below).

The milestones discussed in the task and subtask narrative (see Section 13.3), and tracked in the milestone tables, form the foundation for defining and achieving the project deliverables. It is important that the task structure supports the proposed deliverables and that the proposed deliverables are of high value. Typically, deliverables address KPP-level metrics, but lower-level metrics that are vital to the progression of the project are also acceptable.

Please take care in considering the deliverables that are proposed. These deliverables are what the subcontract will be written around and what, if awarded, the Responder will be paid for when it is actually achieved. Do not propose things you can currently do or things that you feel you cannot do in the specified timeframe. The deliverables should be challenging but achievable. The reviewers consider the proposed deliverables carefully when assigning scores to evaluation criteria.

13.4.a. Tier 1

Given the 12-month period of performance for Tier 1 projects, Responders are not required to undergo a Stage Gate Review. However, Responders to Tier 1 must clearly define and quantify their current baseline status in terms of a figure of merit, which may include one or more of the KPPs listed in Table 4.2, or any other metrics that can be independently verified and demonstrate the promise of the technology. Given the baseline nature of this deliverable and the short Tier 1 period of performance, the verification of this baseline is expected to occur within the first 30 days of the project start date. NREL acknowledges the early stage of Tier 1 projects and anticipates that many awardees will require a quick infusion of capital to significantly accelerate their R&D efforts. For this reason, Responders may receive up to 20% of total NREL funding for successful and timely verification of the project baseline deliverable.

In addition to this baseline deliverable, it is anticipated that approximately five (5) quantifiable deliverables will be identified and verified in addition to submitted reports. Note that the following deliverable requirements should be planned and budgeted in the Table 13.2: Tier 1 Deliverable Table (see below):

- A hardware deliverable that represents the current performance baseline of the proposed technology due within the first month. The payment for this deliverable is limited to a maximum of 20% of the total subcontract value.
- Approximately five to six (5–6) additional deliverables that represent incremental progress toward the final hardware deliverable are anticipated.
- Quarterly Technical Progress Reports at months 3, 6, and 9. These written reports shall be in a short letter format, approximately 5 to 15 pages in length each, with emphasis placed on the status rather than a description of the progress. These report deliverables shall cumulatively represent 5% of the total subcontract value.
- A Final Report detailing the accomplishments of the project and the status of the developed prototype. The final report shall be 5% of the total award value.
- A final hardware deliverable of the prototype due at month 12. This deliverable must be a finished product (cell, module, controller, inverter, rack, etc.) that is capable of undergoing tests and satisfactorily meeting the goals defined within the proposal. The payment for this deliverable must be a minimum of 30% of the total subcontract value.

Note, it is acceptable to use multiple or varying KPPs for each of the approximately five (5) project hardware deliverables, but collectively, these KPPs should encompass the technical requirements needed to fully substantiate the exit criteria of the Tier 1 program.

Table 13.2: Tier 1 Deliverable Table

Tier 1: DELIVERABLE TABLE

Incubator Company:

PI:	**Ph:**	**E-mail:**

12-Month Duration

Task Title	**KPP**	**Criteria and Deliverable** (**S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**imely) What, How, Who, Where?	**Date (Months after subcontract start)**	**% of total NREL funding***	**Additional Notes**
1 Performance	Efficiency, Area	3	1	20%	Unencapsulated and packaged with desiccant. Must be tested immediately after removal from packaging
2 Process Integration	Area, Uniformity		3	10%	Work with NREL to determine the best measurement technique to verify this uniformity over the full device area
1 Performance	Efficiency, Area		9	15%	Same requirements as baseline deliverable

3 Reliability Testing	Reliability		10	15%	Thermal cycling and light soaking done in accordance with IEC testing standards as permitted by NREL facilities
1 Final Prototype Deliverable	Efficiency, Area		12	30%	
****Quarterly Technical Progress Report**				5%	Short letter format, emphasizing status
Draft/Final Technical Progress Reports				5%	
Final Review			12-months after subcontract execution		Detailed accomplishments and status

* % of total NREL funding for a deliverable should be based on the level of effort associated with that deliverable.
** Total price of these deliverables must not exceed 5% of the total subcontract price.

13.4.b. Tier 2

Tier 2 will consist of two (2) phases, with each nine (9) months in duration. A Stage Gate Review will be conducted between the two phases to assess program performance and commercial promise. The Stage Gate Review will evaluate the cumulative 9-month progress toward both the 18-month exit criteria and the approximate three (3) year plan to enter commercial production of the technology. This progress must be designated in terms of specific technical and business commitments, and/or deliverables that will be assessed at the Stage Gate Review and evaluated by the Technical Evaluation (T&E) Team. It is the Responder's responsibility to ensure that any deliverables scheduled to be tested prior to the Stage Gate Review have ample time to be delivered and independently verified. Not meeting Stage Gate Review targets and deliverables along the critical path would trigger an assessment of continued viability of the project. Modifications to Phase II of the subcontract may occur after the Stage Gate Review.

Each Responder should complete the Tier 2 Deliverable Table (Table 13.3) shown below. If the 9-month Stage Gate goals have not been met, as well as other deliverables requirements, NREL will not authorize Phase II (the second 9-month period of performance). The viability of a Responder's commercialization plan, which is subject to both the Responder's aggressive technical progress and changes in market conditions, has significant weight during the Stage Gate Review. In previous Incubator projects, approximately 25% of awardees did not pass the Stage Gate Review. In the majority of

these cases, the awardees successfully met their 9-month contract deliverables, but these delivered milestones failed to collectively demonstrate a likelihood of commercial success. Therefore, Responders are strongly encouraged to identify aggressive 9-month deliverables, which represent both clear progress against an internal baseline and commercial promise against incumbent PV technologies. Note that the following deliverable requirements should be planned and budgeted in the Tier 2 Deliverable Table shown below.

- Approximately 10–14 (5–7 per phase) hardware deliverables, which represent incremental progress toward the Stage Gate Review and 18-month exit criteria.
- Quarterly Technical Progress Reports at months 3 and 6 of each phase, written in a short letter format, approximately 5 to 15 pages in length, with emphasis placed on the status rather than a description of the progress; to be followed one (1) week later (via teleconference) by a detailed progress assessment based on milestones and deliverables to date. These report deliverables shall cumulatively represent 5% of the total subcontract value.
- A Final Report detailing the accomplishments of the project and the status of the developed prototype. The final report shall be 5% of the total award value.

Table 13.3: Tier 2 Deliverable Table

Tier 2: Deliverable Table					
Incubator Company:					
PI:			**Ph:**	**E-mail:**	
Phase I					
Baseline-to-Date					
Task	**KPP**	**Criteria and Deliverable** (**S**pecific, **M**easurable, **A**chievable, **R**elevant, **T**imely) What, How, Who, Where?	**Date (Months after subcontract execution)**	**% of total NREL funding***	**Additional Notes**
1 Cell Performance	Efficiency, Area		2	10%	To be verified at NREL within experimental uncertainty
2 Process Integration	Area, Scale-up		4	5%	We will work with NREL to determine the best measurement technique to verify this uniformity over

					the full device area.
1 Cell Performance	Efficiency, Area		5	10%	To be verified at NREL within experimental uncertainty
3 Preliminary Reliability Testing	Reliability		7	5%	Thermal cycling and light soaking done in accordance with IEC testing standards as permitted by NREL facilities
2 Process Integration	Area, Uniformity: Optimization		8	10%	We will work with NREL to determine the best measurement technique to verify this uniformity over the full device area.
****Stage Gate Review**			9	10%	Demonstrate adequate pilot production
Phase II					
1 Advanced Cell Performance	Efficiency, Area		11	10%	To be verified at NREL
3 Reliability Testing	Reliability		13	10%	Demonstrates interconnect forces sufficient for module assembly
4 Cost Performance	Cost		14	10%	Costs based on equipment quotes and name plate capacity substantiated by current throughput
5 Scale-up	**Pilot Production**		16	10%	Demonstration of a pilot-production run-rate (cells/h) and how this corresponds to a yearly run-rate (kW)

****Quarterly Technical Progress Report**				5%	Short letter format, emphasizing status
Draft/Final Technical Progress Reports				5%	
Final Review					

* % of total NREL funding for a deliverable should be based on the level of effort associated with that deliverable.
** Total price of these deliverables must not exceed 5% of the total subcontract price.

13.5 Business Plan – 3 page maximum

The Responder should identify the target market(s) for commercialization of products developed under this Incubator program, linking the technical requirements for the products servicing the target market(s). Show the linkages of the technical issues to success in the target markets. The discussion of the target markets should include a review of the market(s)' historical trends, growth projections, and the competitive advantage needed to secure the market share required to warrant scale-up. Responders should be as quantitative as possible in this discussion and discuss their current technology status within the context of the relevant KPPs introduced in Section 4 above.

It is the intent that those selected for awards will manufacture their product or processes in the United States and will follow the guidance set forth in the subcontract. The awardees shall explicitly state in their business plan their intent to manufacture in the United States.

The business strategy should also articulate how the Responder intends to leverage the advances made under this work effort into manufacturing scale-up, and the capture of the market share required to finance scale-up. Additionally, the capital plan for commercialization and the source of anticipated funds to support the effort should be detailed. The business strategy should be sufficiently detailed to establish that the Responder's management supports and contributes to the advancement of the technology and has a realistic vision of progress through 2015 and beyond. Additionally, the business strategy should show that the Responder has, or intends to establish, guidance from potential customers of the product, system, or component to assure success. It should also establish that the Responder will conduct its operations in an environmentally safe manner in the United States.

The business plan should clearly demonstrate how commercialization of the product or process meets or exceeds the goals of the SunShot Initiative.

Furthermore, the Responder should provide an overview of the business capabilities and plans to have adequate resources available at the time of a potential subcontract award. The summary should further identify management expertise commensurate with the proposed level of effort and goals.

13.6 Technical Qualifications and Resources – 2 page maximum

This section should clearly and succinctly discuss the qualifications of the Responder's (and lower-tier subcontractor's) infrastructure, resources, and credentials, including previous work efforts and demonstrated innovations, and how these enable the Responder to achieve the project objectives. Include sufficient labor details to support the project development effort.

This section should also list the technical services, to be provided by NREL and other DOE laboratories/facilities, beneficial to the work effort. The technical services available by NREL and other DOE laboratories/facilities will be provided in Amendment 1. The Responder should not contact specific DOE laboratory/facility personnel regarding these support services and no teaming agreements or letters of support are required as part of this solicitation.

13.7 Price Summary Sheet (Attachment A) – 1 page maximum

The price summary shall include all categories of the proposed price and include totals for the12-month term of Tier 1, and each 9-month phase, as well as the total 18-month effort for Tier 2 (see "Letter of Interest Price Summary Sheet" – Attachment A). The proposed price and delivery terms must be valid for 180 days from the date of your LOI response.

Note that the following travel requirements should be planned and budgeted:
(No travel is required for Stage Gate Reviews, as reviews will be conducted via web conference/conference call. Travel to lower-tier subcontractors shall be negotiated.)

- One (1) PV Conference (Domestic location TBD – 1 traveler – 3 days)
- One (1) DOE Annual Review Meeting (Domestic location TBD – 1 traveler – 2 days)
- One (1) Final Presentation at NREL (1 traveler – 2 days).

13.8 Representations and Certifications (not included in total response page count)

The Responder shall complete a "Representations and Certifications for Subcontracts/Purchase Orders" form with original signatures in response to this Solicitation for LOI.

www.nrel.gov/business_opportunities/related_docs.html

(A Responder shall not provide a Social Security Number (SSN) or an Employer Identification Number (EIN). If awarded a Subcontract under this Solicitation, an Internal Revenue Service (IRS) Form W-9 will be provided to the successful Responder to be completed and returned to NREL.)

13.9 Follow-on RFP Process

The following information in italics is provided for planning purposes only and is not part of the submittal requirements of this Solicitation for LOI.

In the event a Responder is selected for negotiations with the intent of reaching agreement on the award of a subcontract:

- *A Request for Proposal (RFP) will be sent to successful Responder(s). The RFP will request that a detailed price proposal be submitted with verifiable and substantiating cost and pricing data. The amount of the individual award will be based on an audit of the price proposal, a technical review of the proposed statement of work (SOW), and negotiations between the NREL Subcontract Administrator and the Responder.*
- *Price proposals and supporting cost/pricing data are required from the successful Responder and each lower-tier subcontractor. The recommended format for the price proposal along with preparation instructions can be located on the NREL website at www.nrel.gov/business_opportunities under "Related Documents & Forms."*
- *The proposal submitted during the RFP phase must demonstrate that proposed costs are reasonable, allowable, and allocable in accordance with FAR Part 31 and DEAR Part 931.*
- *Successful Responders must submit adequate price proposals and supporting cost and pricing data within two (2) weeks following receipt of the RFP. Failure to submit the necessary information within the required time period may result in the termination of negotiations.*
- *Successful Responders will further be required to complete a National Environmental Policy Act (NEPA) Checklist. The checklist must also be submitted within two (2) weeks following receipt of the RFP. The recommended format for the checklist along with preparation instructions can be located on the NREL website at www.nrel.gov/business_opportunities under "Related Documents & Forms."*
- *Successful Responders will need to provide 48-hour turnaround time when developing the SOW with NREL technical staff, and provide timely responses to the Subcontract Administrator during the negotiation process. Failure to do so can result in the termination of negotiations.*
- *Successful Responders may be required to demonstrate their financial capability and confirm available funding to support the proposed project, including the successful Responder's proposed price participation.*
- *Successful Responders will be required to report to the DOE on any subject inventions created as a part of the project (See Attachment D – U.S. Competitiveness Requirements and Utilization Reporting).*

14. Solicitation Provisions—full text provided

a. Late submissions, modifications, and withdrawals of LOIs

LOIs received from qualified organizations after the latest date specified for receipt will not be considered. Modifications to a previously submitted LOIs will not be accepted. An LOI may be withdrawn by written notice received at any time before selection.

b. Restrictions on disclosure and use of data

Responders who include in their LOIs data that they do not want disclosed to the public for any purpose or used by the government or NREL, except for evaluation purposes shall –

1. Mark the title page with the following legend:
   "This LOI includes data that shall not be disclosed outside the government or NREL and shall not be used or disclosed — in whole or in part—for any purpose other than to evaluate this LOI. If, however, a subcontract is awarded to this Responder as a result of — or in connection with—the submission of this data, the government or NREL shall have the right to use or disclose the data to the extent provided in the resulting subcontract. This restriction does not limit the government or NREL's right to use information contained in this data if obtained from another source without restriction. The data subject to this restriction are contained on pages [insert page and line numbers or other identification of pages] of this LOI"; and

2. Mark each page of data it wishes to restrict with the following legend:
   "Use or disclosure of data contained on this page is subject to the restriction on the title page of this LOI."

c. Notice of right to receive patent waiver (derived from DEAR 952.227-84) and technical data requirements.

Responders (and their prospective lower-tier subcontractors) in accordance with applicable statutes and Department of Energy Acquisition Regulations, (derived from DEAR 952.227-84) have the right to request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of the subcontract that may be awarded as a result of this solicitation, in advance of or within thirty (30) days after the effective date of subcontracting. Even where such advance waiver is not requested or the request is denied, the subcontractor will have a continuing right during the subcontract to request a waiver of the rights of the United States in identified, individual inventions.

Domestic small business firms, educational institutions, and domestic nonprofit organizations normally will receive the Patent rights clause—retention by the subcontractor—which permits the offeror to retain title to subject inventions, except in subcontracts involving exceptional circumstances or intelligence activities. Therefore, domestic small business firms, educational institutions, and domestic nonprofit organizations normally need not request a waiver.

If a responder's proposal includes a lower-tier subcontract to another organization, that lower-tier organization's business type will determine the applicable intellectual property provisions that will apply to the lower-tier subcontract. Note that a lower-tier subcontractor may apply for a patent waiver under the same conditions as the responder.

Under a research, development, and demonstration project, the Department of Energy and NREL are unable to ascertain, prior to receipt of LOIs, subsequent proposals, or performance of the project, their actual needs for technical data. It is believed that the requirements contained herein are the basic needs of the Department of Energy and NREL. However, if the responder indicates in its LOI or subsequent proposal that proprietary data will be used or withheld under its proposed effort, the government and NREL reserve the right to negotiate appropriate rights to the proprietary data. The appropriate rights may include "Limited Rights in Proprietary Data" and/or "Subcontractor Licensing."

d. Disclaimer

NEITHER THE UNITED STATES; NOR THE DEPARTMENT OF ENERGY; NOR ALLIANCE FOR SUSTAINABLE ENERGY, LLC, MANAGEMENT AND OPERATING CONTRACTOR FOR THE NATIONAL RENEWABLE ENERGY LABORATORY (NREL); NOR ANY OF THEIR CONTRACTORS, SUBCONTRACTORS, OR THEIR EMPLOYEES MAKE ANY WARRANTY, EXPRESS OR IMPLIED, OR ASSUME ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS, OR USEFULNESS FOR ANY PURPOSE OF ANY OF THE TECHNICAL INFORMATION OR DATA ATTACHED OR OTHERWISE PROVIDED HEREIN AS REFERENCE MATERIAL.

e. Solicitation Disputes

The General Accountability Office and the Department of Energy do not accept or rule on disputes for solicitations for Letters of Interest issued by Management and Operating Contractors for the Department of Energy (operators of Department of Energy National Laboratories). Should a Responder have any concerns regarding the NREL solicitation process or selection determination, the offeror may contact Mark Barela, Advocate for Commercial Practices, at (303) 384-7559. NREL will address each concern received from a Responder on an individual basis.

15. Solicitation Provisions—incorporated by reference—general access

This solicitation incorporates one or more solicitation provisions by reference with the same force and effect as if they were given in full text. The following documents can be downloaded from the NREL **general access** website at

http://www.nrel.gov/business_opportunities/related_docs.html

- NREL Representations and Certifications for Subcontracts/Purchase Orders (08/16/10)

16. NAICS Code and Small Business Size Standard

a. The North American Industry Classification System (NAICS) code for this Solicitation is 541712.

b. The small business size standard for 541712 is 500 employees.

c. For questions about small business size standards please refer to the U.S. Small Business Administration's guide to size standards at http://www.sba.gov/content/guide-size-standards.

ATTACHMENT A – Tier 1

Letters of Interest (LOI) Price Summary Sheet for
Solicitation for LOI No. REU-1-11979
[RESPONDER NAME]

Description	12 Months
A. Direct Materials ($)	
B. Direct Labor ($)	
C. Labor Overhead & Fringe ($) (Specify Rates)	
D. Special Testing ($)	
E. Equipment +	
F. Travel ($)	
G. Consultant(s) ($)	
H. Lower-tier Subcontractor(s) ($)	
I. Other Direct Costs ($) (e.g., Publications, etc.)	
J. G&A ($) (Specify rate)	
K. **TOTAL PRICE ($)**	
L. Responder's Price Participation	
M. NREL's Price Participation	

+ Capital Equipment Funds are not available for this Solicitation. All equipment must be included in Responder's price participation.

ATTACHMENT A – Tier 2

Letters of Interest (LOI) Price Summary Sheet for
Solicitation for LOI No. REU-1-11979
[RESPONDER NAME]

Description	Phase I 9 Months	Phase II 9 Months	18 Month Total
A. Direct Materials ($)			
B. Direct Labor ($)			
C. Labor Overhead & Fringe ($) (Specify Rates)			
D. Special Testing ($)			
E. Equipment +			
F. Travel ($)			
G. Consultant(s) ($)			
H. Lower-tier Subcontractor(s) ($)			
I. Other Direct Costs ($) (e.g., Publications, etc.)			
J. G&A ($) (Specify rate)			
K. **TOTAL PRICE ($)**			
L. Responder's Price Participation			
M. NREL's Price Participation			

\+ Capital Equipment Funds are not available for this Solicitation. All equipment must be included in Responder's price participation.

ATTACHMENT B

DOE Technology Readiness Levels (TRLs) Applicable to This Solicitation

TRL 4: The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of ad hoc hardware in a laboratory and testing. Supporting information includes the results of the integrated experiments and estimates of how the experimental components and experimental test results differ from the expected system performance goals. TRLs 4–6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system. The laboratory system will probably be a mix of on-hand equipment and a few special-purpose components that may require special handling, calibration, or alignment to get them to function. An example in PV might include the first attempts to fabricate a new PV device design in the laboratory. The concept is there, but the details of the unit process steps are not yet worked out. The goal of TRL 4 should be the narrowing of possible options in the complete system.

TRL 5: The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. Supporting information includes results from the laboratory-scale testing, analysis of the differences between the laboratory and eventual operating system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. The major difference between TRLs 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical. An example in PV might be the fabrication of devices that closely match or exceed the expected efficiency targets, but that are fabricated in the lab manually with minimal automation compared to that necessary for full-scale production. Scientific risk should be retired at the end of TRL 5. Results presented should be statistically relevant.

TRL 6: Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. Examples include fabrication of the device on an engineering pilot line. Supporting information includes results from the engineering-scale testing, analysis of the differences between the engineering scale and prototypical system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. TRL 6 begins the true engineering development of the technology as an operational system. The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the final system. For PV cell of module manufacturing, the system that is referred to is the manufacturing system and not the cell or module. The engineering pilot-scale demonstration should be capable of validating all the processes and functions that will be required of a full manufacturing system. The operating environment for the testing should closely represent the actual operating environment. Refinement of the cost model is expected at this stage based on new learning from the pilot line. The goal while in TRL 6 is to reduce engineering risk. Results presented should be statistically relevant.

ATTACHMENT C

Concentrating Solar Thermal Power (CSP) Topic Areas:

- Low-cost solar field components and systems: Concepts should target solar field costs on the order of $\$100/m^2$ or less. Concepts that lend themselves to automated manufacturing, minimal field grading and site preparation, and rapid installation will be favored. Concepts may include (but are not limited to):
    - Advanced polymeric or thin-glass front-surface reflectors with increased reflectivity (>95% specular) and durability.
    - Anti-soiling coatings and low-to-no water cleaning techniques.
    - Low-cost drives that employ less conservative or alternative designs.
    - Accurate (<1 mrad pointing accuracy), self-aligning control systems.
    - Alternative collector designs that use significantly less material.
    - Non-steel based support structures.
    - Wireless methods for power and communication.
    - Closed-loop tracking.
- High-temperature storage materials and systems: Concepts should target thermal storage temperatures on the order of 650°C or greater at a cost of $\$15/kWh_{th}$ or less. All system concepts should have efficiency, η, of > 98%. This efficiency should be calculated via the equation:

$$\eta = \frac{Q_{output}\left[1 - \frac{298K}{T_{process}}\right]}{Q_{input}\left[1 - \frac{298K}{T_{receiver}}\right]}$$

Where:
Q_{output} = the energy flow from the storage system to the power conversion cycle
Q_{input} = the energy flow into the storage system from the solar collection system
$T_{process}$ = the temperature at which the storage system releases heat to the power conversion cycle (K)
$T_{receiver}$ = the temperature at which the storage system collects heat from the solar receiver (K)
For storage systems where $T_{process}$ varies as the system discharges, the numerator of the efficiency, η, needs to be integrated over the full discharge time. The storage system needs to have power density such that the system can discharge at a thermal rate that accommodates the nominal power rating of the plant for the full discharge period.

In the case of material development, the material should be able to be placed into a "typical" thermal storage system suitable for the material being developed and meet the above efficiency and cost targets. For example, the typical storage system for a liquid-state sensible storage system is a direct two-tank system, while for a solid-state sensible storage system it would be a solid block system with the heat transfer fluid flowing through the block, either in direct contact with the solid material or through piping. Concepts may include (but are not limited to):

- New fluids thermally stable to temperatures greater than 650°C with a melting point less than 250°C, preferably 0^{o}C, to be used both as a heat transfer fluid and thermal storage media in a typical two-tank storage or single tank thermocline system. Additionally, this fluid should have viscosity of less than 5cp and a vapor pressure of less than 1 atmosphere over the 250°C to 650°C operating range. Fluid density should not exceed 3,000 kg/m^3. These materials must be compatible with stainless steel or nickel alloys.
- Storage systems that are compatible with supercritical steam or carbon dioxide. In these systems, the supercritical fluid would function as both the heat transfer and working fluids.
- Solids to be used in a solid-state sensible heat storage system capable of operating at temperatures greater than 650°C. These solids should have a thermal conductivity greater than 1W/mK and a heat capacity of greater than 1.5J/gK while having a minimal amount of thermal expansion over the temperature range of 250°C to greater than 650°C.
- Development of new, inexpensive materials for use as containment or piping of high temperature fluids. These materials must be able to withstand operating at temperatures greater than 650°C and under continuous thermal cycling (>10.000 cycles) from 250°C to greater than 650°C. These materials should be compatible with molten salts or other fluids capable of achieving 650°C operation, and should cost less than the current nickel alloys used at these temperatures.
- Any new sensible heat storage (solid or liquid phase), phase change material, or thermochemical storage system designs that meet the above efficiency and cost targets.

- High-temperature receiver materials and systems: Concepts should target outlet heat transfer media temperatures on the order of 650°C or more. Concepts may include (but are not limited to):
  - Alternative, low-cost receiver materials capable of reliable operation over many thermal cycles (>10,000).
  - Alternative receiver designs that enable efficient solar collection at high temperatures.
  - Solar selective coatings that maintain high absorptivity with reduced emissivity.
- High-efficiency power cycles: Concepts should target conversion efficiencies on the order of 45% or more at operating temperatures between 600°C and 800°. Turbines, once fully developed, should be capable of operation at sizes as small as 5-100MW. Once fully developed, turbines should cost less than \$900/kW_e Concepts may include (but are not limited to):
  - Supercritical steam Rankine turbines
  - Supercritical CO_2 turbines
  - Supercritical steam Rankine turbines with a bottoming cycle
  - Supercritical CO_2 turbines with a bottoming cycle
- Novel CSP systems: Concepts that diverge from conventional CSP technologies (parabolic trough, power tower, dish-engine, linear Fresnel), or concepts that combine two or more of the aforementioned topics. Concepts should provide viable pathways to commercialization and low-cost (6¢/kWh or less) electricity.

ATTACHMENT D

U.S. Competitiveness Requirements and Utilization Reporting

U.S. competitiveness requirements states that a U.S. small business and their exclusive licensees must substantially manufacture in the U.S. products embodying subject inventions developed using government funds in the U.S. for any use or sale in the U.S.

Utilization reporting ensures that U.S. small businesses holding title to subject inventions developed using government funds are taking appropriate steps to commercialize the subject inventions. The U.S. small business is required to complete this annual report even after the subcontract completion. To ensure that Prime recipients and sub recipients holding title to subject inventions are taking appropriate steps to commercialize the subject inventions, the DOE requires annual reporting on utilization of the subject inventions and efforts by the Prime Recipients, Sub recipients, or their assignees and licensees to further utilization of subject inventions. Recipients are required to provide this information on an annual basis even after the termination of the funding agreement.